

Salt lake Community College
MATH 1060 Trigonometry
Final Examination
Fall 2007

Name _____

This exam has three parts. Carefully read the instructions for each part. All problems are of equal point value.

The exam is closed book with no notes or formula sheets allowed.

When the directions specify "exact value", a calculator should not be used.

Part I
Multiple Choice

Circle the best response. Solve all problems in this section. No partial credit will be given.

- 1) If s denotes the length of the arc of a circle of radius r subtended by a central angle θ , find s . $r = 23.43$ centimeters, $\theta = 5.7$ radians.

A) 134.6 cm B) 135.6 cm C) 132.6 cm D) 133.6 cm

- 2) Find the exact value. $\sec 45^\circ$

A) $\sqrt{3}$ B) $\frac{2\sqrt{3}}{3}$ C) $\sqrt{2}$ D) $\frac{\sqrt{2}}{2}$

- 3) Find the exact value of the indicated trigonometric function of θ .

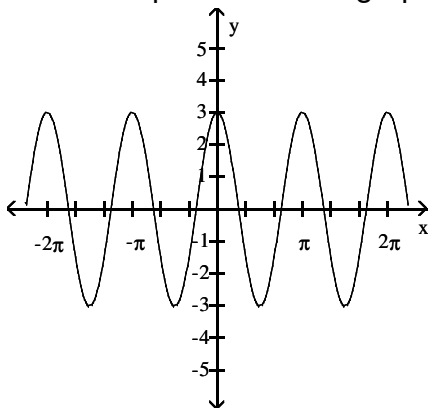
$\cos \theta = \frac{2}{3}$, $\tan \theta < 0$ Find $\sin \theta$.

A) $-\frac{\sqrt{5}}{3}$ B) $-\frac{3}{2}$ C) $-\frac{\sqrt{5}}{2}$ D) $-\sqrt{5}$

- 4) For what numbers θ is $f(\theta) = \tan \theta$ not defined?

A) odd multiples of π (180°) B) integral multiples of π (180°)
C) odd multiples of $\frac{\pi}{2}$ (90°) D) all real numbers

5) Find an equation for the graph.



- A) $y = 2 \cos (3x)$ B) $y = 3 \cos (2x)$ C) $y = 3 \cos (\frac{1}{2}x)$ D) $y = 2 \cos (\frac{1}{3}x)$

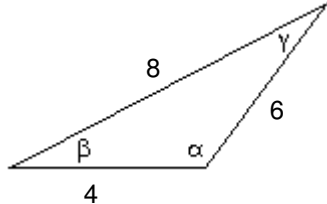
6) Use a calculator to find the value of the expression in radians rounded to two decimal places. $\cot^{-1}(-\frac{10}{21})$

- A) -64.54 B) -0.44 C) -1.13 D) -25.46

7) Solve the equation on the interval $0 \leq \theta < 2\pi$. $2 \cos (2\theta) = \sqrt{3}$

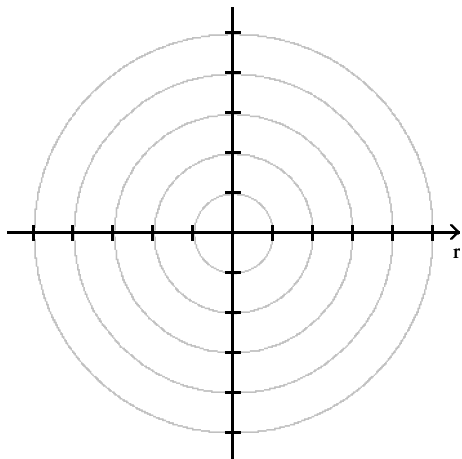
- A) $\frac{3\pi}{2}$ B) $\frac{\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{23\pi}{12}$
 C) $\frac{\pi}{6}, \frac{11\pi}{6}$ D) $\frac{\pi}{2}$

8) Find the area of the triangle. If necessary, round the answer to two decimal places.

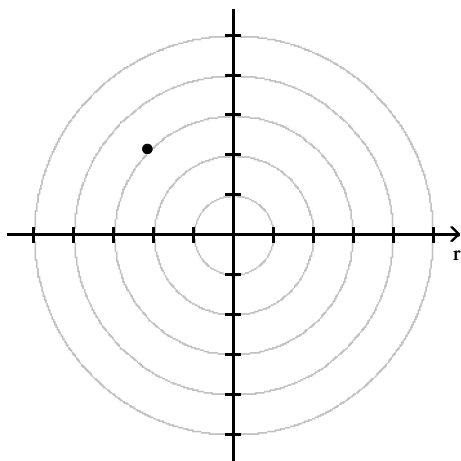


- A) 3.87 B) 173.9 C) 11.62 D) 40.99

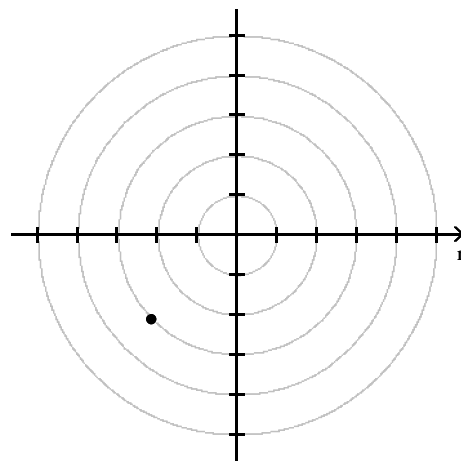
9) Plot the point given in polar coordinates. $(-3, -\frac{\pi}{4})$



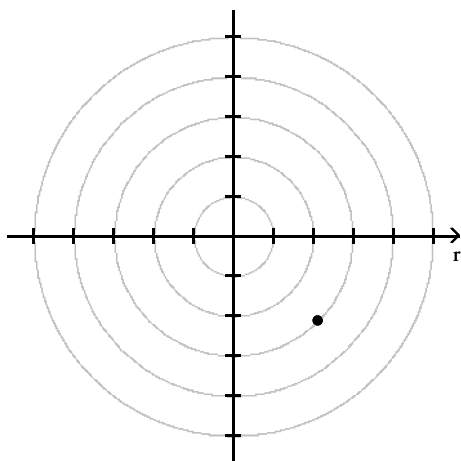
A)



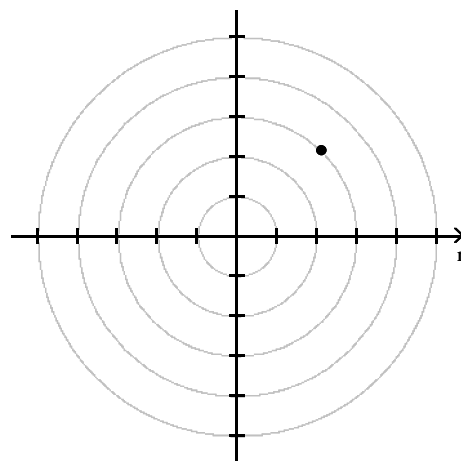
B)



C)



D)



- 10) An object attached to a coiled spring is pulled down a distance $a = 7$ from its rest position and then released. Assuming that the motion is simple harmonic with period $T = 5$ seconds, write an equation that relates the displacement d of the object from its rest position after t seconds. Also assume that the positive direction of the motion is up.

A) $d = -5 \cos \left(\frac{2}{7} \pi t \right)$
C) $d = -7 \cos \left(\frac{1}{5} \pi t \right)$

B) $d = -7 \cos \left(\frac{2}{5} \pi t \right)$
D) $d = -7 \sin \left(\frac{2}{5} \pi t \right)$

- 11) Find the **domain of rectangular equation** for the plane curve defined by the parametric equations. $x = 3t$, $y = t + 4$; $-2 \leq t \leq 3$

A) $-\infty < x < \infty$

B) $-\frac{2}{3} \leq x \leq 1$

C) $2 \leq x \leq 7$

D) $-6 \leq x \leq 9$

- 12) The vector \mathbf{v} has initial position P and terminal point Q . Write \mathbf{v} in the form $a\mathbf{i} + b\mathbf{j}$; that is, find its position vector. $P = (-5, 3)$; $Q = (6, -1)$

A) $\mathbf{v} = 11\mathbf{i} - 4\mathbf{j}$

B) $\mathbf{v} = 3\mathbf{i} + 4\mathbf{j}$

C) $\mathbf{v} = -4\mathbf{i} + 11\mathbf{j}$

D) $\mathbf{v} = 4\mathbf{i} + 3\mathbf{j}$

- 13) Which of the following vectors is orthogonal to $20\mathbf{i} - 8\mathbf{j}$?

A) $15\mathbf{i} - 6\mathbf{j}$

B) $-10\mathbf{i} - 25\mathbf{j}$

C) $20\mathbf{i} + 4\mathbf{j}$

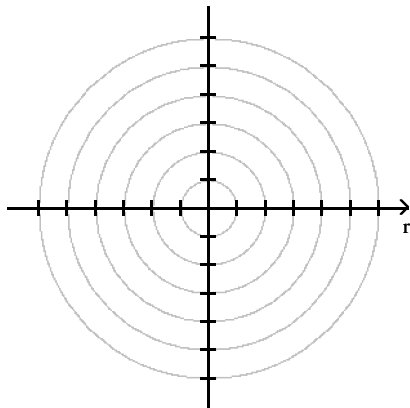
D) $4\mathbf{i} + 3\mathbf{j}$

Part II

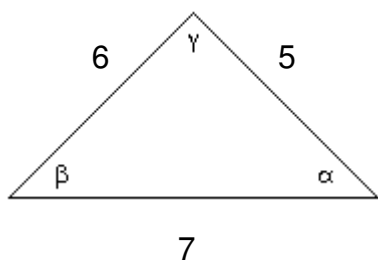
Work all problems in this section. Show detailed solutions. Full credit will be given only if appropriate work is shown.

- 14) **Convert** the complex number $z = -\sqrt{3} + i$ to polar complex form. **Compute** z^6 . Leave your final answer in polar complex form.

- 15) **Identify** and **graph** the polar equation. Each tic mark represents 2 units. **Give** the coordinates, (r, θ) , of at least four points. $r = 4 + 6 \sin \theta$



16) Solve the triangle. **Round answers to one decimal place.**

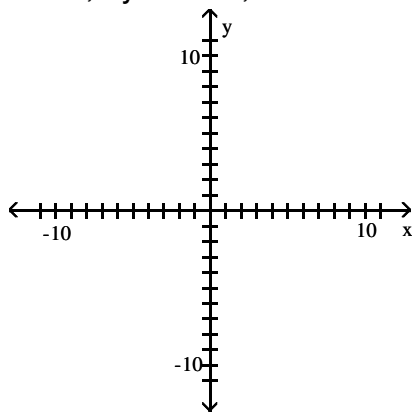


17) Two sides and an angle are given. Solve any triangle(s) that results. **Round answers to two decimal places.**

$$a = 32, b = 11, \beta = 10^\circ$$

- 18) **Graph** the curve whose parametric equations are given. **Label** at least 4 points.
Indicate the orientation of the graph.

$$x = 2t - 1, \quad y = t^2 - 7; \quad -4 \leq t \leq 4$$



- 19) Solve the equation. Find all solutions.

$$\sin(2\theta) + \sin \theta = 0$$

20) Find the exact value of the expression.

$$\cos \left(\tan^{-1} \frac{4}{3} - \sin^{-1} \frac{3}{5} \right)$$

21) Find the angle between **v** and **w**. Give the answer in **degrees**. Round your answer to one decimal place.

$$\mathbf{v} = 8\mathbf{i} + 5\mathbf{j}, \quad \mathbf{w} = 7\mathbf{i} - 4\mathbf{j}$$

Part III

Work four (4) problems in this section. Cross out the problems you do not want graded. Show detailed solutions. Full credit will be given only if appropriate work is shown.

22) Establish the identity. $\sin(\alpha + \beta) \cos(\alpha - \beta) = \sin \alpha \cos \alpha + \sin \beta \cos \beta$

- 23) A person is pulling a freight cart with a force of 56 pounds. How much work is done in moving the cart 20 feet if the cart's handle makes an angle of 33° with the ground?
Round answers to one decimal place.

- 24) The displacement d (in meters) of an object at time t (in seconds) is given. **Describe** the motion of the object. What is the **maximum displacement** from its resting position, the time required for **one oscillation**, and the **frequency**?

$$d = 8 \sin \left(\frac{\pi}{2} t \right)$$

25) At a golf course, the distance from the tee to the hole is 479 yards. A famous golfer tees off and slices his drive 10° to the right of the line from tee to the hole. If the drive went 288 yards, how many yards will the golfer's second shot have to be to reach the hole? **Round answers to one decimal place.**

26) A surveyor standing 50 meters from the base of a building measures the angle to the top of the building and finds it to be 37° . The surveyor then measures the angle to the top of the radio tower on the building and finds that it is 47° . How tall is the radio tower? **Round answers to one decimal place.**

27) For the equation $y = -\frac{1}{2} \sin(4x + 3\pi)$, identify (i) the **amplitude**, (ii) the **phase shift**, and (iii) the **period**. Draw the **graph**. **Label** both the x-axis and y-axis with appropriate scale marks.

28) Given the complex numbers z and w , find $\frac{z}{w}$. Leave your answer in **polar complex form**. $z = 1 - i$, $w = 1 - \sqrt{3}i$

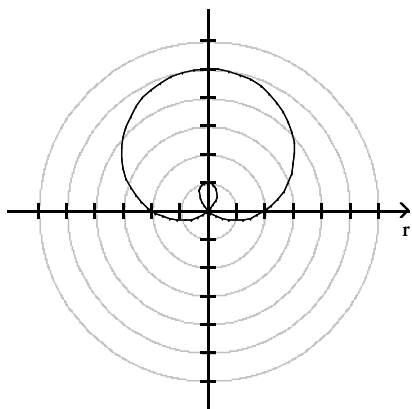
29) Find a rectangular equation for the plane curve defined by the parametric equations. State the domain of the rectangular equation.

$$x = 5 \cos t, y = -2 \sin t; 0 \leq t \leq 2\pi$$

Answer Key

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- 1) D
- 2) C
- 3) A
- 4) C
- 5) B
- 6) C
- 7) B
- 8) C
- 9) A
- 10) B
- 11) D
- 12) A
- 13) B
- 14) $64(\cos 180 + i \sin 180)$
- 15)



limaçon with inner loop

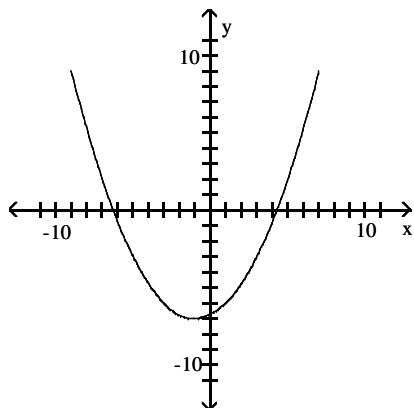
Students should list at least 4 points.

- 16) $\alpha = 57.1^\circ$, $\beta = 44.4^\circ$, $\gamma = 78.5^\circ$
- 17) two triangles
 $\alpha_1 = 30.34^\circ$, $\gamma_1 = 139.66^\circ$, $c_1 = 41.01$ or
 $\alpha_2 = 149.66^\circ$, $\gamma_2 = 20.34^\circ$, $c_2 = 22.02$

Answer Key

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18)



There should be markings on the graph to indicate orientation.

Students should give at least 4 points on the graph.

19) $0 + 2k\pi$, $\pi + 2k\pi$, $\frac{2\pi}{3} + 2k\pi$, $\frac{4\pi}{3} + 2k\pi$

Note: The first 2 solutions may be replaced by $k\pi$. Where k is any integer.

20) $\frac{24}{25}$

21) 61.8°

22) Answers may vary.

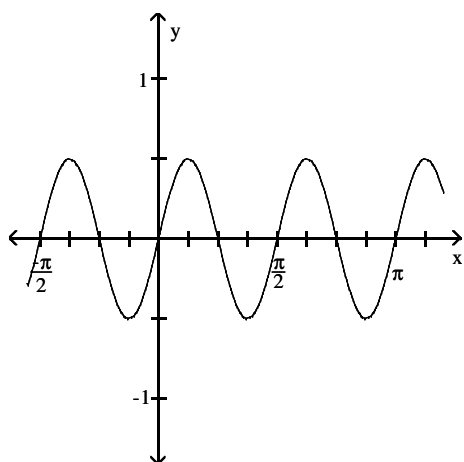
23) 939.3 ft-lb

24) simple harmonic; 8 m; 4 sec; $\frac{1}{4}$ oscillation/sec

25) 201.7 yd

26) 15.94 m

27) (i) $\frac{1}{2}$ (ii) $-\frac{3\pi}{4}$ (iii) $\frac{\pi}{2}$



Answer Key

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28) $\frac{\sqrt{2}}{2}(\cos 15^\circ + i \sin 15^\circ)$

29) $4x^2 + 25y^2 = 100$ or $\frac{x^2}{25} + \frac{y^2}{4} = 1$; $-5 \leq x \leq 5$